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VIEWS OF NATURE.

CHAPTER XI.

ORIGIN OF MATTER—ATOMS OF MATTER INDESTRUCTIBLE AND UNCHANGEABLE—ORIGIN AND PROPAGATION OF PLANTS, ANIMALS AND MAN—THEORY OF EVOLUTION—MATTER AND FORCE—VITAL FORCE AND INTELLECT—CAUSE AND EFFECT—UNIVERSAL ATTRACTION—AND AN IMAGINARY ETHER.

The Origin of Matter.

The origin of matter is beyond the domain of human knowledge. It is to man not only unknown, but unknowable. His faculties are so limited that he cannot imagine, nor conceive, how matter could have originated. He cannot conceive how it could have been created out of nothing—how it could have been eternal, nor how it could have come into existence in any manner whatever. All he can know is the simple fact of its existence, and must content himself with studying the phenomena of its action, and the evidences of its action in the past; and must infer its properties and forces from its action. The scriptures do not explain the mystery. Contemplating matter as in existence in a chaotic, and perhaps a nebulous condition, we can form some imperfect conceptions of the gradual formation of our earth and solar system, and of some of the changes which the earth and its surface and atmosphere underwent, before it was fitted for the abode of man.

The Atoms of Matter Indestructible and Unchangeable.

That matter is indestructible is generally believed by chemists, and seems to be proven by experiments in chemistry. When compounds are destroyed by combustion, or by chemical action, the atoms thereof appear in new combinations, and form new compounds. However changeable compounds may be, the elementary atoms of which they are composed are supposed to be absolutely indestructible and unchangeable, either in form, substance, or properties. Whatever may have been the origin of matter, and when its origin, we have reason to believe, that for millions of years past, there has been no increase or diminution of the number of atoms of any class or element of matter in the universe, and no change in the substance, form or properties thereof; that though new compounds were constantly forming for millions of years perhaps, while the chaotic materials of which our globe is composed were drawing towards each other, becoming one body, and contracting, and the crust of the earth was forming and growing thicker, and before it attained a condition fit for the abode of man—not an atom of matter was created during that long and unknown period.

The Origin and Propagation of Plants.

When portions of the earth's surface were raised by internal convulsions above the ocean, and became dry land, we have reason to believe that grass, herbs and trees soon sprang up, and the earth was clothed with vegetation; but long before that period the waters teemed with shell-fish and the lower grades of marine animals. The question arises, how did plants and animals first come into existence. Did their origin involve the creation of new matter—of additional atoms and elements of matter, or only new forms, or-

ganisms and types, out of the elements and materials previously existing? The teachings of the book of Genesis, as well as the deductions of human reason, are both consistent with the latter theory—that creation in the case of plants and animals is only the production of new combinations, new forms and organisms, from old materials. If so, were they first produced by the direct act of God, or indirectly by the spontaneous action of the elements and forces of the material world? Were they not produced by a living principle, co-operating with other elements and forces of nature?

There is no more difficulty in conceiving that the first vegetable organism was produced by the spontaneous action of a living organizing principle co-operating with other forces of nature, than in conceiving how, at this day, a blade of grass or of grain can spring from its proper seed, grow up and produce seed in its turn, and thus propagate itself from year to year, and from century to century. *The how—the modus operandi—and the causes and details of the process, are mysteries beyond the domain of human science; and yet we witness the results of such processes every day of our lives.*

It will not be affirmed by any person of common sense, that the seed of a plant or tree possesses any creative power to originate and call into existence de novo the atoms of matter that will form the future plant or tree, which may spring from it. Nothing of the kind will be pretended; and yet the seed possesses an inherent power, which, when warmed with caloric and swelled with moisture, attracts to itself materials which it absorbs, assimilates and forms into sap and into vessels and fibres—whereby it grows, matures, and forms other seed in its turn. This attraction and absorption of food, assimilation, germination and growth, is a process of nature; and yet it is not a process carried on by chemical attraction, nor by the attraction of cohesion. It is a process very different from that which forms water and crystals, rocks and earths. It is impossible to conceive how vegetable pro-

cesses can be carried on without some element and force unknown to the chemist—without a vital organizing principle—co-operating with other forces of nature.

The vital organizing element, existing in the earth as well as in plants, is itself the germ of the plant, the life and active element of the seed, without the shell—and when that is admitted, there is no more difficulty in conceiving *how plants can be developed* from the natural seed existing in the earth, than in conceiving how they are produced from seeds grown upon other plants.

The same course of reasoning applies to the origin, propagation and growth of animals, so far as their physical organization is concerned; but as every animal has intellect, it is more difficult to conceive whence come their intellects.

Geologists and the science of Geology inform us, that the surface of the earth has undergone many changes, and suffered many revulsions and upheavals; that it was once wholly covered with water; and that its continents and islands rose above the waters of the ocean at different periods. Whether matter itself be, or be not, eternal, the land animals and vegetation must have had a beginning—an origin. They must have been created at different periods, upon different continents and islands, or been produced spontaneously by the properties and forces inherent in matter. Many islands have been formed in shallow seas and great rivers, within the era of authentic history, which have been very quickly and rapidly clothed with vegetation of various kinds, and covered with large trees,—according to the climate and soil—which cannot be accounted for upon any principal but new and special creations by Deity, or by spontaneous generation. The theories that they spring from seeds transplanted to such islands by winds, waters and birds, are too irrational and whimsical to be worthy of serious consideration.

The Origin of Man and Animals.

The origin of man, with his wonderful intellectual faculties, is equally obscure as that of the earth. After some rude type of man originated, we can conceive how the mere physical organization of the species was propagated and gradually developed and improved, from generation to generation, under improved conditions and an improving atmosphere; but it is difficult to conceive his origin, and still more difficult to form any clear conception of the origin of the wonderful intellect of every member of the human family,—unless it be an emanation from a Divine Spirit.

There is no difficulty in conceiving that vegetable germs and organisms may be formed by the spontaneous action of the vital organizing element, co-operating with other forces of nature; but it being undeniable that animals, and even the lowest grade of insects, manifest some degree of intellect, we cannot conceive how their intellects could originate, or how they can, at this day, be multiplied by propagation—each animal having its own intellect—except under one of the following conditions:

1st. That intellect, and the degree of intelligence which animals have, is the result, effect and product of the organization of unintelligent matter—or

2d. That some element of matter, pervading the crust of the earth or the waters of the earth, having a strong affinity for the vital element, is *endowed with the property of intelligence*, and readily unites with the germs and organisms formed by the vital element, and thus forms the intellect of the animal; or

3d. That each animal intellect is specially created and communicated to the organism by the Deity.

The first supposition—that a combination of unintelligent atoms of matter can produce intelligence and intellect, is to my mind inconceivable. It seems to involve an impossibility, and a self-evident fallacy. This supposition is in accordance with the materialistic view of the question.

The second supposition is conceivable. It seems rational, in accordance with the phenomena of nature,—with the mode in which the earth has been changed from a state of chaos to its present condition, and clothed with vegetation—and with the mode in which God governs the universe, by means of secondary causes and agencies.

It by no means follows, that the origin of the intellects of rational and moral beings like man, is the same as that of the brute creation. The wonderful reasoning powers, great inventive faculties, and elevated moral character of man, when compared with the limited faculties of the brute, occupied with matters of sense only, indicate that the intellect of the former had a higher origin, and has a nobler destiny than that of the latter. The immortality of the soul of man, does not involve nor indicate the immortality of the mind of the beast and insect

*The Production of Plants and Animals, not the
Creation of New Matter.*

We may state the proposition as an absolute truth, (if there be any truth in human science,) that no process of nature, no germination of a plant, and no propagation and production of an animal, can create or originate an atom of matter, or add to the atoms or quantity of matter previously existing in the universe. All such processes are only modes in which changes are effected—by which latent elements are attracted by natural affinities and forces, drawn forth, developed, and presented in new combinations and new forms. Friction produces heat; but it does not, and can not, create an element of matter, nor add to the atoms of matter existing previously. It merely developes and makes sensible elements of heat which were previously latent; it does not create nor add any element of heat to the previously existing stock.

The Evolution Theory.

The theory of evolution has been supposed by some to solve the mysteries of creation. Evolution is not a creation of matter, but a mere change in its condition and combinations. It produces no new atoms of matter, but merely forms new combinations of the atoms of matter in existence. It is not the origin of things, but a mere change in their forms and modes of existence. *It is not in any sense a power or cause, which creates, originates, produces, or increases the stock of matter in the universe; but merely a process* whereby matter is changed in its combinations, and organized into living animal and vegetable organisms. Not being a cause of the origin or action of matter, but a mere process of action, *a power, force or cause of action must lie behind it*, or be inherent in matter itself—which causes atoms and bodies of matter to move and produce the changes involved in the process.

Forces and powers, acting as causes, are necessary to originate the process of evolution, and to carry on and continue it, after it originated. It is like a complicated machine, which works admirably when put into operation, and its action maintained by a competent motive power; but has no power to move itself. Hence the theory of evolution throws no new light upon either the creation of matter, the formation of the earth, the origin of vegetation, animals, or man, or upon the science of animal and vegetable physiology. It does, however, throw much light upon the changes in animals, the multiplication of varieties, and the origin of new varieties and species—arising from the mixture of breeds, changes of climate and food, and different circumstances and modes of living.

The theory of a vital element in nature, distinct and different from all the other elements—acting as an organizing force, to unite and form other elements of matter into living organisms, if made a basis of the theory of evolution, as the cause and motive power required to originate and carry on the process, would

give the theory a basis of action, and some degree of consistency, so far as regards vegetation and the brute creation.

The forces of nature recognized by chemists and by the school of materialists—comprising the chemical affinities and the attraction of cohesion, the action of heat and electricity, gravitation and magnetism, are not sufficient to account for either vital or mental action. Other forces are required to produce the complicated, various, and wonderful action and phenomena, exhibited in plants and animals, as well as by man.

Matter—How Defined by Professor Pynchon.

Prof. Pynchon says: “The name matter may be given to any substance which is cognizable by any one of the senses. Everything not cognizable by the senses (he says) passes under the name immaterial.” His definition is imperfect, for it would exclude from the category the vital element—the living organizing principle—because the chemist cannot separate it from the organism which it has formed, and make it manifest to the senses, as a distinct element, though it may have nearly all the properties which he assigns to the coarser elements of matter.

Prof. P. says: “All matter possesses the four properties of *Extension, Impenetrability, Inertia and Weight*. We know (he says) that a body possesses extension from its occupying a portion of space; we know that it possesses impenetrability, from its not allowing another body to occupy this space, at the same time with itself; we know that it possesses inertia, from its want of power to change its state, to move, if at rest, to cease to move, if in motion.” His statement of the properties of matter, and some of his illustrations in support of it are unsatisfactory to my mind, and very defective. Not only the action of the chemical affinities, but the movements of the heavenly bodies in their orbits, the germination, development and

growth of vegetation and animals, and all the physical action in the universe, attest the activity and active properties of matter, and are inconsistent with the assertion that matter is inert.

While the intellectual principle is self-acting, and can originate action in and of itself, and give motion to itself, independently of all other elements—unintelligent and inanimate matter is not self-acting, and cannot originate action in and of itself alone, nor give motion to itself without the concurrent attraction of some other element or body acting upon it—the mutual affinity and concurrent attraction of the two co-operating to produce motion and change. This incapacity of any element of matter to originate action in and of itself, and to move independently of other elements or bodies, is called *inertia*. *Matter is inert in no other sense.*

What is called inertia is a purely negative quality or condition, and not, strictly speaking, a property of matter. It is no more a property than cold is, which is merely the negation or absence of heat.

Again, the learned Professor's statement—including weight as a necessary property of matter, excludes from that category electricity as well as caloric or heat. The fact that electricity, exhibited in flashes of lightning, rends in pieces trees, buildings and other material things, is sufficient to establish its material nature; and the equally significant fact, that caloric or heat (call it by whichever name you please) expands all metals and fluids which it permeates, proves beyond a doubt that it occupies space, like the grosser elements of matter. The action and various phenomena of heat, electricity, and the vital organizing element, all show that gravitation or weight is not a necessary property of matter—and that those three elements of matter, and perhaps others, exist without any such property.

Prof. P.'s views of matter are tinctured and warped by the mystical philosophy, which has grown up, permeated, and in many respects perverted the physical science and literature of this age.

My Views of the Properties of Matter.

The properties of matter are :

1st. Substance—or in common scientific parlance, extension and impenetrability, by reason whereof it occupies a certain portion of space, and no two atoms or particles of matter can, at the same instant of time, occupy the same space.

2d. Every atom or particle of matter, as well as every combination of atoms, must have *form* as well as substance.

3. We have reason to believe that every atom or particle of matter in the universe has active properties, which we call affinities and powers of attraction, by means whereof single atoms as well as compounds and large bodies, virtually act upon and attract each other, and thereby produce constant action and change.

The active properties of matter may be classed as follows :

1st. That power of attraction known as chemical affinity, is the affinity or attraction of atoms of different elements of matter for each other, which causes them to unite and form compounds—either liquids or solids. The affinities of oxygen are so numerous, that it will combine either singly, or in union with other elements, with nearly every element of the material world ; while the affinities of nitrogen, hydrogen, carbon, all the metals and all the earths, are very few and limited, each to a small number of other elements ; but the chemical combinations of matter are so numerous as to number thousands.

2d. The attraction of cohesion—by virtue of which certain elementary substances and also the molecules of certain compounds are drawn together and adhere together and to each other, with greater or less tenacity. All the metals have great cohesive power ; the power of attraction, which holds their atoms together, is very great, which makes them very compact and tough, and renders iron and copper very hard and peculiarly tough and strong. The gases in their

elementary state as gases, have no cohesive power whatever. Neither oxygen, hydrogen, nor nitrogen, in its original or separate state, has any cohesive power; but when oxygen and hydrogen are combined in forming matter, the particles or molecules of the fluid have a slight cohesive power, as all fluids have.

3d. The mutual attraction between compounds of matter and bodies at greater or less distance from each other, known as gravity, or gravitation. Gravity operates at distances of hundreds of millions, and even thousands of millions of miles, and keeps the planets in their orbits—revolving around the sun. On the contrary, the chemical affinities and the attraction of cohesion operate only at insensible distances.

Of caloric, electricity, magnetism and the vital element, I may say, that each has affinities and powers of attraction peculiar to itself—neither of them having any such affinity or power of attraction as cohesion, gravity, or chemical affinity; and hence they are properly classed as imponderable elements. Caloric has strong affinities for, and permeates all the compounds of the material world, and yet it forms no chemical or permanent compounds. Though the vital element, and caloric also, co-operate with the chemical affinities in forming chemical compounds, as parts of animal and vegetable organisms, yet they merely permeate and act with and upon such chemical combinations, without forming any permanent part thereof; for they escape at the death of the animal or plant—while the texture of the bones and muscles of animals, and the woody fibers of trees, may last for hundreds, and even thousands of years.

Though caloric, electricity, and magnetism have certain affinities for other elements of matter, each peculiar to itself—yet they seem to be mostly governed by their own inherent properties and powers to act upon other elements, which have very little power to act upon them. Not being under the influence of the attraction of gravitation, they are known as imponderable elements, and are often called forces—on account

of their great mobility and power, their peculiar action, and the impossibility of confining them in vessels and jars, as you can confine all the ponderable elements known to the chemist.

Force—What is it?

The chemical affinities, the attraction of cohesion and gravitation, are each and all properties and forces inherent in matter, and inseparable from the matter of which they are properties. This is very generally believed and taught by chemists; and if it be not true, there is no certainty nor truth in chemistry, nor in any of the natural sciences. It is, to my mind, *a self-evident truth, that all force, power, energy, and causes of action and change, are inherent properties of substance of some kind, and cannot exist distinct from and independent of substance.* I cannot conceive the possibility of a force or cause of action existing separate and distinct from substance. Call it in some instances spiritual substance, if you please, to distinguish it from the grosser elements and combinations of matter; but it must have at least one of the properties of matter—it must occupy space.

It is true that the active properties of matter—its chemical affinities and other forces of attraction, cannot be seen by the eye, distinct from matter itself, and are matters of inference only—mere deductions of human reason, from the phenomena of the material world and the changes which the earth and its inhabitants have undergone, and which its atmosphere and its vegetation do undergo during the different seasons of each and every year; and yet such natural affinities and forces are as real to the reasoning mind, as they could be, if we could see and feel them—measure and weigh them. Single atoms of the grossest matter, are so minute as to be beyond the reach of the senses. It is only combinations of numerous atoms which the eye can see; and yet the fact that matter exists in too minute subdivisions to be seen, is none the less a reality—

a truth which all chemists, and all persons of cultivated minds will acknowledge. The living body is constantly supplied with heat—permeated with caloric and with electricity also—but both are latent, and as invisible as the vital principle or the intellect.

The forces of nature may be classed as follows :

1st. The powers of attraction between the atoms of different elements of matter, known as chemical affinities.

2d. The attractive power of cohesion.

3d. The mutual attraction between bodies and compounds of matter, at greater or less distances from each other, denominated gravity.

4th. The peculiar affinities, powers of attraction and forces of caloric.

5th. The peculiar affinities, powers of attraction and forces of electricity.

6th. The peculiar force, denominated magnetism.

7th. (And lastly) the peculiar affinities and forces known as the vital forces.

Forces are Simple and Compound.

The forces of nature are simple and compound. Every element of matter has properties peculiar to itself, differing from the properties of every other element. The properties of elements constitute the *simple forces of nature*, which are as indestructible and unchangeable as are the atoms of matter of which they are properties. When two or more elements are combined, forming a compound, the forces inherent in the several elements of the compound are blended together—forming a compound force.

Compound forces, being the result of many simple forces varying from each other, and often in some measure conflicting, and thus neutralizing and balancing each other, are as changeable as the compounds from which they result, and upon which they depend.

The simple forces are not very numerous, as the

elements of matter are limited in number; but the compound forces, resulting from combinations of matter, are almost infinitely numerous and various.

The Forces of Nature Multifarious and Conflicting.

The forces of nature are many, and not one only, as some are inclined to think. They are various and multifarious—numerous and complex—not few, nor simple; conflicting and in some respects antagonistic—not harmonious. Their action results from their variety, and their approximation to general harmony and uniformity of action results from great variety in detail, of *antagonisms balanced*.

Every action and change in the universe, intellectual as well as physical, must be produced by the affinities and properties, powers and forces inherent in substance of some kind—each element and force producing its appropriate action. As every element has affinities for more than one other element—oxygen having affinities for nearly all the elements of the material world, and the vital element affinities for nearly twenty other elements, the various combinations of elements, and the forces resulting therefrom, are almost infinitely various. It required a great number as well as a great variety of powers and forces to produce the infinite variety of chemical and physical, vital and mental action, which is exhibited in the universe. It would be impossible even for God to endow any one element of matter with conflicting and antagonistic forces—to make it ponderable and imponderable, active and inert, and to move in all directions at the same instant of time, and from one and the same influence; and hence, to insure such variety of action he has created a great number of elements, endowed each with peculiar affinities for other elements—so as to produce a great number and variety of combinations and forces. Nature is not simple, but wonderfully complex.

There is no unity, but infinite variety of force. Every element and force acts according to its peculiar nature. Like produces like, in all nature's organisms, and operations. Every plant and tree, animal and thought, feeling and impulse, comes from its appropriate germ and force; and it would be as reasonable to expect an oak tree to spring from a pumpkin seed, or a monkey from a grain of wheat, as to expect any living organism to spring from inanimate elements only, or to expect consciousness and thought to come from unintelligent matter.

The Vital Force Antagonistic to Gravitation.

All the ponderable elements and bodies of matter on or near the surface of the earth, have a gravitating tendency towards the centre of the earth, in proportion to their density. This tendency we call weight. There is no element of matter known to the chemist, on or near the earth's surface, except caloric, electricity and magnetism, which is destitute of the force of gravity; and none which, combining with ponderable matter, acts so powerfully in antagonism to the force of gravity as to overcome that force, and raise ponderable elements and their compounds from the earth into the atmosphere. Smoke and steam ascend—not that they are destitute of gravity, or are propelled upward by caloric or any other element, but they ascend for the same reason that feathers and balloons do—because, being lighter than atmospheric air, the latter presses down with greater force than they do, and thus tends to displace them, to occupy their places near the surface of the earth, and to force them up into the rarer and lighter air of the higher atmosphere.

The vapor which is formed upon the surface of water and moist earth by the attraction and action of the sun, and raised into the atmosphere to form clouds, is lighter than the lower strata of atmospheric air—and hence it ascends. It has a gravitating tendency, and yet it is carried up, perhaps mostly by the sun's attrac-

tion, but partly as smoke and steam are carried up,—by the heavier atmosphere tending to displace it, and to supply its place, and thus indirectly force it upwards. On the contrary, the sap of plants and trees, though as heavy as water, ascends in appropriate tubes and vessels, without being forced up by the gravitating tendency of a heavier element displacing it, and forcing it upward,—as is the case with smoke and other light substances.

While smoke and other light substances are raised by the indirect action of gravity, the sap of plants and trees is propelled upwards by the direct action of some element acting antagonistically to the force of gravity. Sap is carried up in appropriate vessels to the tops of trees, from one hundred to two hundred feet from the ground. It could not ascend if it were not propelled by the power of some element acting directly in opposition to the force of gravity. It is impossible to account for its ascent, unless living vegetation contains some elementary substance, unknown to the chemist, which acts antagonistically to the force of gravity, and overcomes its powers. *From the action of living organisms, I infer the existence of an element having power to act upon other elements and compounds, to overcome their chemical affinities and gravitating forces, to unite and form them into living organisms, and to carry their appropriate food and sap upward, contrary to the forces of gravity.* The force which accomplishes such ends and purposes, has been called by medical men, the vital force. The element of matter, of which that force is an inherent property, may very properly be called the vital element, or living principle.

Though the power of attraction of the sun evaporates water, and draws vapor into the atmosphere, to form clouds and rain, the sun never raises a large body, nor a dense body of any size, from the surface of the earth; but the vital element aided and stimulated by intellect and caloric, enables animals of all sizes, weighing from a grain to a ton, to raise themselves

from the ground, in opposition to the force of gravity,—to carry heavy burthens—and to move in opposition to violent adverse winds.

From lands heavily timbered, with trees from fifty to over an hundred feet in height, 200 cords or more of wood are often cut from an acre; which, when green, will weigh about a ton to the cord. This 200 tons weight, to each acre of ground—consisting of water, carbon, silica, potash, and other elements of ponderable matter, have been actually absorbed from the earth, and carried up in sap vessels from one foot to over one hundred feet in height. How has this been effected, unless there is in nature some element of matter, which acts antagonistically to the power of gravitation?

During the life of an organism the vital element must control—the vital force predominating over gravity and the chemical forces; but when the vital element passes away at death, the chemical forces assume its place, and dissolution soon commences. At first, the organization is perfect, except that the motive power which moved the machinery of life is gone. However perfect all the parts of the organism, it cannot operate itself, nor act without a motive power. Sap never rises in a dead tree or plant.

Fermentation is a chemical process, whereby inanimate materials operate upon each other—and cause the lightest to rise, and the heaviest to settle to the bottom; but I know of no element, except the vital element, and no force other than the vital force, which can raise so heavy a compound as the sap of trees and plants—from one foot to an hundred feet or more, above the surface of the earth. The ascent of sap in trees and plants, and of blood in animals, contrary to the force of gravity, presents a problem worthy of consideration.

*Intellect or Spirit Distinguished from Matter
and Nature.*

Nature comprises not only all the ponderable elements of matter known to the chemist, but also the imponderable elements which are destitute of consciousness, intelligence, or any kind of knowledge; and it is impossible to conceive how any combination of them can produce any property or force, power or capacity, which none of the several elements possess. All of those elements are distinguished from spirit or intellect in this—that they are unintelligent matter—while the latter must be substance endowed with intelligence, consciousness, volition and capacities to acquire knowledge—else it could not act upon, as well as in, a material organism, and produce such effects as it does. Its action indicates that it is a source and cause of action, independent of matter—outside of and above nature—acting, to a large extent, supernaturally. Human consciousness, and all the operations of the human mind, attest to the existence of intellect, as a substance distinct from the organization of the brain—as something existing in the living brain, which does not remain in it after death.

Many conflicting influences act upon bodies of matter at the same instant of time, and their motions become resultants of the numerous forces acting upon them. Generally speaking, but one influence, idea, or motive, and never more than two, act at the same instant upon the mind; and it can turn from one to another, and examine each of many, one after another, and choose between them—its action never being determined by what, in mechanics and physics, is called the resultant of many influences.

Mind—even the human mind—acts from forces which we call volition and intelligence, and not from a natural, material, blind and unintelligent force. Intellect is believed to be an intelligent principle, capable of receiving and acquiring knowledge—of perception and conception, of reasoning and acting according

to its knowledge—or arbitrarily. Though it is acted upon by material forces, acting through the physical organization of the brain and nervous system, which very generally control the common mind; yet it is capable of acting, and often does act, contrary to natural forces and influences—with a view to effect moral and religious ends and purposes. The independence of the intellect is shown most conspicuously in resisting evil influences—more conspicuously in its negative, than in its positive action; and hence the importance of having the mind well stored with sound moral principles—to enable it to resist bad and corrupt influences.

Nature, and all the elements of matter, are governed by inherent properties and forces which are unchangeable—always the same—never increased or diminished in power—unless by the direct agency of the Divine mind. Hence, their action is uniform—always the same. On the contrary, the human mind is governed by volition, which is changeable and may act arbitrary, and by *intelligence, which may be increased and accumulated—which may be true or false, right or wrong, and is generally more or less imperfect. Hence the great diversity of thought, views and opinions of mankind—no two persons thinking alike on many questions.*

Cause and Effect—What are Causes?

There can be but one proper meaning of the word *cause, and that is, force or power, inherent in spirit and matter, which produces action, motion and change.* What the schoolmen and theologians call final causes, are not, strictly speaking, causes, but purposes, or ends to be attained, and not causes. What are called final causes follow action and never precede it—whereas causes always precede action, and produce it.

The antecedents in a succession of events are not the causes thereof, as is maintained by Hume and many

other philosophers ; but the active forces in nature and mind, by which the succession of events are produced, are the real and efficient causes. The causes of human actions are appetites and passions, wants and desires, avarice and ambition, sympathy and affection, humanity and philanthropy, hatred and revenge.

Day and night regularly and constantly succeed each other, but no man in his senses would say that day is the cause of night, or night the cause of day. High tides and low tides regularly succeed each other twice every day, but it would be idle to pretend that high tide causes low tide, or that low tide causes high tide. We must look to other things, outside of the succession of day and night, high tide and low tide, as the causes thereof. *We must look to the forces of nature, which cause the motions and revolutions of the earth and the heavenly bodies, as the real causes of the succession of day and night.*

Every effect and change in the universe must be wrought by some cause—either by the power of mind, or by the forces of nature inherent in matter—operating as causes ; but the condition of things must be such as to bring a cause or causes into operation. The attractive power of the sun illuminates the side of the earth turned toward it, and causes everything so operated upon and illuminated to operate directly upon the nerves of the eye, and cause the sensation of light ; but the sun can produce such effects only upon one-half of the surface of the earth at the same time.

To produce action, motion, and effects, there must be a cause, and such a condition of the cause and things to be operated upon, as to bring the cause into operation, before any effect can be produced. For example, sparks of fire sometimes escape through defective chimneys and stove pipes, lodge in the roof, floor, floor timbers, or other combustible matter of or in buildings, set them on fire, and destroy them. In such cases the element of *fire is the cause, the active element and force which destroys the building*—the defective chimney or stove pipe, and the combustible matter in

the vicinity of it, being the conditions which enable the cause to operate and produce the effect. The defect in the chimney or pipe is not the cause of the combustion, nor is the combustible matter which receives the spark the cause of it—for without fire in the chimney or stove no sparks could escape, and no combustion could take place; and yet, with the fire in the chimney or pipe, no such effects could take place without both of the conditions named. Fire cannot burn without combustible matter, nor can combustible matter burn until fire comes into contact with it. The supposed defect in the chimney or pipe and the existence of combustible matter in the vicinity, are both necessary conditions—to bring the cause into operation—to enable the spark of fire to come into contact with something that will burn; and yet these conditions are both entirely distinct from the cause of the combustion.

When man acts, the causes and the machinery of his action are still more numerous and complicated—including appetites and passions—as exciting causes—sometimes purposes and ends to be attained, instruments of action, and conditions or circumstances, as well as opportunities. When crimes are prompted and induced, or caused by a spirit of revenge, another element enters into the chain of causes—that is, provocation, family or national hatred, arising from some anterior cause—that operates, excites, and causes the spirit of revenge, which is the immediate cause of the crime.

The forces of nature constitute the material causes of all the action and changes in the universe.

Universal Attraction.

That combinations and bodies, as well as atoms of matter, act upon each other by *some mysterious force or power, which we call attraction*—and do so at all distances, at great as well as at insensible distances, and even at the distance of hundreds of millions

of miles, is attested by the constant motion of the earth and the planets, in their respective orbits around the sun, and by all the phenomena of our solar system. The whole science of Astronomy is based upon the *theory of universal attraction*. The moon, though at a distance from the earth of nearly a quarter of million of miles, acts upon its waters with such force as to cause the tides of the ocean.

The surface of the earth, and everything connected with the earth, above its surface, is drawn towards the centre of the earth by that *mysterious force*, which, in that mode of its action, we call *gravity or gravitation*. Everything around us denser than atmospheric air, when raised from the earth and left unsupported, falls immediately to the ground. The weight of all bodies and elements of ponderable matter, depends upon the force which we call gravity.

The chemical affinities, by which the atoms of different elements of matter are drawn towards and to each other, until they unite and form a compound, constitute another mode of action of the force of universal attraction. The powers of cohesion and adhesion are other modes in which the force of universal attraction acts. The power or force by which bodies at greater or less distances act upon the organs of sight of man and all animals, is but another mode in which the power or force of universal attraction acts.

In every class of cases referred to, except cohesion and adhesion, the force of attraction acts at a distance from the bodies which exert it. The chemical affinities, by which atoms of matter are drawn towards each other and united, must act at some distance, until the union is formed; and then the force which holds them together is called the attraction of cohesion.

How the force of attraction, inherent in matter, can exert an influence at a distance from its surface, is a *mystery which man can never solve*. Like the origin of matter and its wonderful properties, the subject lies beyond the domain of human science—beyond the sphere of human conception, in the obscure regions of

the unknown and the unknowable. As we must content ourselves with the simple fact of the existence of matter, without capacity to determine its origin or mode of creation—and must content ourselves with such inferences as we can draw from natural phenomena and chemical experiments, of the properties and forces of matter, and their modes of action—so *we must content ourselves with the knowledge of the simple fact of the existence and action of universal attraction, without capacity to determine how it exists, or how it acts.*

Sir Isaac Newton, in one of his letters to Bentley, says: “It is inconceivable that inanimate brute matter should, without the mediation of something else, which is not material, operate upon and affect other matter *without mutual contact*, as it must do if gravitation, in the sense of Epicurus, be essential and inherent in it; and this is one reason why I desire you should not ascribe innate gravity to me. That *gravity should be innate, inherent, and essential to matter, so that one body may act upon another at a distance, through a vacuum*; without the mediation of anything else, by and through which their action and forces may be conveyed from one to another, is to me *so great an absurdity*, that I believe no man who has in philosophical matters a competent faculty of thinking, can ever fall into it.” Such were the views, and such the doubts and queries of one of the most distinguished philosophers which the world has ever produced.

An Imaginary Elastic Medium, Called Ether.

In the vain attempt to obviate the difficulties suggested by Newton, as to the cause of gravity and its mode of action, and to inquire into and understand what the limited faculties of man are incapable of understanding, it has been conceived that all space and the whole universe is pervaded by *an elastic medium called ether*, which is the cause of gravitation, and operates as the bond of union between the heavenly

bodies, as well as between the earth and its atmosphere, and all the elements and combinations of matter on or near the surface of the earth.

What a magnificent theory ! But how is the supposed elastic medium to operate ? If it be inanimate matter, without intelligence and without will, it must act blindly, from its own *innate, inherent, and essential properties and forces*, as the inanimate brute matter operates, which is known to the chemist, and which our senses and intellect take cognizance of ; and if its atoms or particles do not all touch each other, and touch all the bodies and elements of matter in the universe, so as to leave no vacuum, the difficulties suggested by Newton, of the force of gravity acting at a distance, would still remain. The supposed elastic medium, if not a part of the Divine Spirit, and moved by the Divine Will, would have no properties, powers, or forces different from those which we can conceive inanimate and unintelligent matter to be endowed with ; and hence, it would not solve the question of the action of bodies of matter upon each other at a distance, nor remove any of the difficulties involved in it. It would be as difficult to conceive how the supposed ether could act with such mysterious and wonderful powers, as it is to conceive how inanimate and unintelligent matter can act without such medium. The mystery would still remain.

To assume that a subtle, elastic ether pervades all space, does not solve the mystery, nor in the least degree lessen it—unless you also assume that the supposed ether constitutes the animus mundi of the ancients—is the God of the Pantheist—and constitutes the only force in the universe—constituting not only the force of gravity, but also the chemical affinities and forces, the power of cohesion, and the peculiar force of caloric, electricity, and magnetism. There is no basis but Pantheism upon which to found the assumed ether ; and I cannot conceive how it can exist and exercise such various and mysterious powers, unless the Pantheistic system of theology be true.

If, in accordance with the views of some theological theorists, we were to suppose that all the action of what we call gravity and attraction, is produced by the direct act and agency of God, the mode of such action and the instrumentalities employed, would still be mysterious. The mode in which the Infinite Being acts, and the instrumentalities which he uses, are, and must be, mysterious to finite beings, and beyond their capacity to understand or conceive. This may as well be admitted by scientists and philosophers, and when that is done, they need not worry their brains and minds to conceive imaginary mediums and instrumentalities, to account for the modes of action of gravity, and the various other forces included in the term attraction. So far as finite beings can see and understand, gravity, and all the forces included under the general term attraction, are inherent properties of matter, which cause distant bodies to act upon and attract each other—by means whereof, every thing on and near the surface of the earth is drawn towards the centre of the earth, and the earth and the planets are kept in their orbits, and caused to move around the sun.

Let us consider some of the familiar facts in relation to the action of gravity. A stone or rock rolled from the edge of a precipice or steep ledge, bounds down the side of the precipice with great velocity, leaping into the air from point to point, and continuing its course until it reaches the bottom, or some level ground. When apples and other fruits growing upon trees become ripe, the stems which attach them to the trees become weak, and they fall to the ground. What causes the descent of the stone in the one case, and the apples in the other? Can there be any reasonable doubt that *the earth draws them by the direct force of its power of attraction, operating upon them at a distance, and without actual contact?* Can any other rational explanation be given of such phenomena? Is any other explanation consistent with chemical action? Does the assumption of the existence of an elastic me-

dium of ether aid in solving the question? If such medium exists, and the earth's attractive power is exercised only upon the contiguous particles of ether, and they communicate a force from one set of particles to another, until a force reaches the stone or the apples, the earth itself would exercise no power over the stone or the apples; on the contrary, they would be influenced only by the force inherent in the contiguous ether. To suppose that the attractive force of the attenuated ether in contact with the stone and apples would be sufficient to cause their fall, is to make a supposition which violates the great cardinal principle of gravitation—that when two bodies mutually attract each other, the power which each exerts on the other is in proportion to the quantity of matter contained in it. The moon being less than one-sixtieth part as large as the earth, its motion is controlled by the attraction of the earth—so that it is carried around the earth nearly thirteen times each year, in its general course around the sun—its action upon the earth being comparatively small.

In the supposed case of the stone and apples falling, if the earth exercised no direct force upon them, its force being exercised only on the elastic ether in contact with it—which communicates a force from atom to atom of the ether until the atoms of ether in contact with the stone and apples exert an ethereal influence upon them, it will be perceived that the stone and apples are so much larger and denser than the attenuated ether, that it could exert no perceptible influence on them; on the contrary, they would control the ether, as the earth and sun jointly control the motion of the moon—and instead of falling to the ground, *stones and apples would remain suspended in space.* The supposed elastic ether is entirely too weak and feeble to do the work assigned to it.

The August and September numbers, of the year 1874, of the *Catholic World*, contains articles on "Matter," in which the ether theory is denied, and combated with numerous arguments, and its absurdi-

ties pointed out. On page 585 it is said: "That attraction excludes material contact is quite evident, for *attraction produces movement by causing the approach of one body to another*; and it is evident that no approach will be possible if the bodies are already in immediate contact." Hence the conclusion is drawn (p. 587) "That distance is a necessary condition of the action of matter upon matter," and "that any material substance, which is any where by reason of its matter, *has within itself a power prepared to act, where the substance itself is not present by its matter.*"

On pages 590 and 591 it is said, "Some modern physicists hold that what we persist in calling *universal attraction*, is not attraction, but only *an ethereal pressure exercised on the heavenly bodies*; * * * that the ether which surrounds and presses the earth must be denser on the hemisphere where there is night, than on that where there is day, because the former is more distant from the sun than the latter; and they infer that on the former hemisphere the pressure must be greater than on the latter; which brings them to the conclusion that the earth must move towards the sun with a velocity proportional to the difference between the two pressures. Such is the theory by which some modern thinkers tried to supplant universal attraction. We need not go far to show *the utter absurdity of this rash conception*, as the most common phenomena and the most elementary principles of mechanics supply us with abundant proofs of its falsity."

In the conclusion of the article, referring to the ether theory, it is said, "It is strange, indeed, that *a theory, so preposterous in its assumptions and so absurd in its consequences*, can have found favor with scientific writers, in the full light of this nineteenth century?"

Views of Prof. Grove, on the Ether Theory.

Prof. W. R. Grove, of England, is one of the apostles of the mystical philosophy of heat, and the

mutual convertibility of the physical forces into each other; and yet he repudiates *the ether theory*, and bases the action of matter upon what he terms the *dynamical theory* of forces, motion and heat. In his preface to his work on "The Correlation of Physical Forces," he says: "It appears to me that heat and light may be considered as affections; or, according to the undulatory theory, vibrations of matter itself, and not of a *distinct ethereal fluid* permeating it. These vibrations would be propagated, just as sound is propagated by vibrations of wood (or atmospheric air) or as waves by water. To my mind, all the consequences of the undulatory theory flow as easily from this, as from the *hypothesis of a specific ether*; to suppose which, namely, to suppose a *fluid sui generis, and of extreme tenuity penetrating solid bodies*, we must assume, first, the existence of the fluid itself; secondly, that bodies are without exception porous; thirdly, that these pores communicate; fourthly, that matter is limited in expansibility. None of these difficulties apply to the modifications of this theory, which I venture to propose; and no other difficulty applies to it, which does not equally apply to the received hypothesis."

In the work referred to, the Professor, treating of electricity, says: "If, instead of being regarded as a fluid or imponderable matter, *sui generis*, electricity be regarded as the *motion of an ether*, equal difficulties are encountered. Assuming ether to pervade the pores of all bodies, is the ether a conductor or non-conductor? If the latter—that is, if the ether be incapable of transmitting the electrical wave—the *ethereal hypothesis* of electricity necessarily falls; but if the motion of the ether constitutes what we call conduction of electricity, then the most porous bodies, or those most permeable by the ether, should be the best conductors; but this is not the case. If, again, the metal and the air surrounding it are both pervaded by ether, why should the electrical wave affect the ether in the metal, and not stir that in the gas? *To support an*

ethereal hypothesis of electricity many additional and hardly reconcilable hypotheses must be imported." page 102.

After giving (pages 107 and 108) cases of the action of electricity, he says: "These cases afford an additional argument to those previously mentioned, of the particles of matter being effected by the forces of electricity and magnetism, in a way *irreconcilable with the fluid or ethereal hypothesis.*"

Again he says, (p. 124): "The transmission of electricity through long wires in preference to the air which surrounds them, and which must be at least equally pervaded by the ether, is *irreconcilable with such a hypothesis.*"

Again he says: "The phenomena presented by heat, viewed, according to the dynamic theory, cannot be explained by the motion of an imponderable ether, but involve the molecular actions of ordinary ponderable matter. * * * * An objection that immediately occurs to the mind in reference to the *ethereal hypothesis of light* is, that the most porous bodies are opaque; cork, charcoal, pumice stone, dried and moist wood, &c., all very porous and very light, are all opaque."—(p. 124 to 127.)

Again, he says; "Ether is a most convenient medium for hypothesis; thus, if to account for a given phenomena the hypothesis requires that the ether be more elastic, it is said to be more elastic; if more dense, it is said to be more dense; * * * * and so on. The advocates of the ethereal hypothesis have this advantage, that the *ether being hypothetical* can have its characters modified or changed, without any possibility of disproof, either of its existence or modifications."—(p. 133.)

The most conclusive evidence that the various phenomena of light are not produced by undulations of any such medium as the supposed *ether*, is the fact, that light moves in straight lines only, and does not pass through crooked, circular, or bent tubes or passages; whereas water and all fluids, air and all gases,

will pass through crooked and circular tubes and passages, as freely as through those that are straight.

The ether hypothesis will soon be exploded, and regarded as an absurd heresy, and common sense people will express astonishment, that men of learning and science ever should have been under the influence of such delusion, as to receive the heresy as a scientific truth. But when persons ignore the evidence of their own senses or consciousness, disregard common sense and the common understanding of mankind, and wander in the mazes of scholastic theories, they have no true land-marks to guide them, and are soon lost in scholastic subtleties and sophistry.

CHAPTER XII.

THE NEW, OR MYSTICAL PHILOSOPHY—ITS ASSUMPTIONS AND ERRORS POINTED OUT, EXAMINED, AND DISCUSSED.

The Mystical Philosophy—What it Comprises.

The two theories—first, that an elastic medium called ether, permeates all matter, and fills or permeates all space—and, second, that heat is only a mode of motion, constitute the two chief corner stones of the new system of philosophy; which seem to me so strange and mystical, that it may properly be called the *mystical philosophy*, or the mystical system of philosophy.

It comprises—

- 1st. A denial of the existence of any such principle or force as universal attraction—operating at a distance, upon which the whole science of astronomy is based, and substitutes in its place an *imaginary ether, as the motive power* which moves the earth and the planets around the sun—whether by attraction or repulsion, the advocates of the system are not agreed.
- 2d. It denies the existence of any such element as caloric, and denies also that heat, or the cause thereof, is material, or an element of matter, and insists that it is a mere mode of motion.
- 3d. It affirms the undulatory ether theory of light.
- 4th. The chemical theory of combustion.
- 5th. The chemical theory of organization, life,

and mind—that life, mind, and thought, are the mere results of organization ; and

6th. The dynamical, or mystical theory of force—that the naturol forces are not inherent properties of matter, but an immaterial mystical agent, acting through the imaginary or supposed ether, independent of any matter known to the chemist ; that heat, electricity, and magnetism, are like gravity—not elements of matter, but immaterial forces of nature ; and that all the forces of nature, including light, are substantially one and the same force, and may be transmuted or changed, each into either of the other forces. It denies the existence of any vital organizing element of matter—forming the basis of life ; ignores the existence of any such spiritual essence as intellect—forming the basis of conscience, intelligence and thought ; and deduces the phenomena of life and mind, consciousness and thought, from the chemical and dynamical action of the forces of nature.

The new philosophy is very nearly identical with the Pantheistic theory of the universe. The germ of the motion theory of heat originated with Count Rumford, the last part of the 18th century ; some slight traces of the theory of an elastic medium, is of older date—but the new system of philosophy has been gradually developed and matured during the last fifty years, or since the year 1820, until it has become one of the most stupendous fabrics of assumption and sophistry ever presented to the human mind.

A Vague and Indefinite Use of Words.

In matters of science words should be used with great precision and accuracy, and in senses that are well understood and defined. They should not be used loosely and vaguely, in an indefinite and uncertain sense. Many words and phrases are used in the new and mystical philosophy, in senses that are indefinite and obscure, inconsistent with each other, and sometimes in a mystical sense. Among the words

and phrases so used, are the following: heat and motion—mode and form—force and energy—immaterial forces—dynamical energy or force—dynamical cause or causes—mechanical force or forces—molecules, molecular force, and molecular action—ether and luminiferous ether—transformation of force, and conversion of force—evolution and development.

The manner in which such words and phrases are used in books of science, serves to obscure the subject treated, rather than to throw light upon it. Abstract terms are often used as if they represented a force or power, independent of matter. The words heat and motion, force and power, cause or causation and energy, dynamical power and dynamical force, and some other words, are used in the NEW PHILOSOPHY in a mysterious and mystical sense—as if they were immaterial agencies—existing without substance and independent of matter. The words heat and light, electricity and magnetism, are used as representing one and the same mysterious agency or force, manifested under different circumstances, in different modes—each being convertible into either of the others.

The most of the scientists of the mystical school assume that there is an elastic ether, sometimes called luminiferous ether, pervading all matter and all space, which they seem to regard either as the one great force of nature, manifested in different modes, or as the medium through and by which the immaterial agencies of nature act. But Prof. Grove discards the ether theory as an untenable hypothesis, and relies entirely upon the dynamical theory and dynamical forces as an immaterial agency, and the only active forces of nature.

Heat, or Caloric, and its Action.

Heat, or rather the cause of heat, (caloric) cannot be a mere mode of motion, for many reasons. Mere motion and the mode thereof, is of itself powerless. It is not matter, nor material, has not the force of mat-

ter, and is not, and cannot be, an efficient cause of action or change. Caloric is very different. It is so material in its character and properties, that it occupies space, and expands all bodies which it permeates. It is the great solvent, and the great stimulant of the universe. Neither combustion, chemical action, fermentation, vital action, vegetable growth and development, animal life and growth, evaporation, nor even the motion of the atmosphere, can be originated or continued without it. It is radiated into the atmosphere, and can be felt as an independent substance, and carried in and by the winds hundreds of miles. It passes from one body to another, and can be accumulated and intensified by accumulation. It never ceases to exist in any body, or compound of matter, whether such body be in motion or at rest; but to accumulate it, and produce the greatest intensity of heat, as in a retort, or in the coal or metal in a retort, the thing in which it is accumulated must be at rest—and not in motion. Rapid motion is not consistent with much accumulation or great intensity of heat. Generally speaking, the greater the heat at or near the surface of the earth, the stiller the atmosphere. Though the simooms of the deserts of the Torrid zone are hot, the winds blowing from twenty to an hundred miles an hour in high latitudes, are generally cold. The temperature of the winds is never increased by their velocity, but depends upon the season of the year, and the direction from which they come.

If heat were a mere mode of motion, then a state of rest, the cessation of motion, would cause the instantaneous cessation and annihilation of all the heat produced by the motion of the moving body; and it would be impossible to accumulate heat to such a degree of intensity as to melt iron, or to produce great fires, and extensive conflagrations.

Caloric and a few of the metals, are the only elements of the material world that were known to the ancients. Caloric was known for thousands of years before any other element was known, except some of

the metals—when water and atmospheric air were both regarded as simple substances. It is more clearly discovered by the senses than any element known to the chemist, except some of the metals. It is the most powerful of all the elements of the material world—being the great solvent of nature. It permeates, expands, fuses and destroys every compound of nature; and yet, the very existence of this most powerful, best known, of all elements, has been thrown into doubt, by a class of scientists. An obvious truth, that heat is caused by an element of nature, is denied; and a contrary proposition, that heat is a mere mode of motion, is affirmed as true, and dignified with the title of a scientific truth—though it is based on assumptions which seem contrary to common sense, and supported by a course of artificial reasoning which appears mystical and sophistical.

Motion.

Motion is not a force, power, or cause; but simply a condition of matter in a state of change—an effect produced by some active force. Motion is a changeable and accidental condition of matter, and cannot exist independent of matter; while the cause of motion is the active force or power inherent in the matter itself—being as indestructible as are the atoms of matter. It is true that a body in motion will produce effects which a body at rest cannot do; but such effects are secondary, the first effect being the motion itself, which is produced by the inherent properties and forces of the body itself, and of other bodies and forces acting upon it, and co-operating with it—which properties and forces produce the secondary as well as the primary effects. Motion alone cannot produce any effect whatever. It cannot even develop heat, without friction, nor produce any of the phenomena usually produced by caloric.

Motion not being a substance—not being material—not being matter, nor even an attribute of matter,

but only a condition of matter in a state of change, the thing itself ceases to exist the moment the moving body ceases to move. It cannot be preserved for a single moment, and cannot be accumulated. Heat cannot be mere motion, for heat can be accumulated and is accumulated to an almost indefinite extent in blast furnaces, and in such fires as the great conflagration in Chicago, in 1871, and the great fire in Boston in 1872. And when accumulated in furnaces, stoves, steam boilers and stones, heat can be preserved for many hours, after the combustion and consumption of the fuel which produced it has ceased.

Again, if heat were mere motion, the degree of its intensity would necessarily depend upon the velocity of the moving body. How does that theory of heat agree with the fact that iron is heated in a furnace or forge fire, first to a brown heat, then to redness, and finally to a white heat, when the iron itself is at rest, and the furnace is also at rest.

The velocity of the earth's motion on its axis and in its orbit, is the same at the 50th degree of latitude in each hemisphere—whether the north or the south pole be inclined toward the sun. If the earth's motion be heat, and the great source and cause of heat upon its surface, why is it sometimes intensely hot as high as the 50th degree of north latitude in summer, when the north pole is inclined toward the sun, and intensely cold at the same time at the south pole? If motion be heat, why is there perpetual snow on the mountain peaks of Mexico and South America in the torrid zone, when it is excessively hot in the neighboring valleys, within an hundred miles of such snow-clad peaks?

Motion alone cannot generate matter, nor produce any change in matter. What is said in common parlance to be produced by motion, is in fact produced by one or more bodies in a state of change, and not by motion itself. Nor are the properties or forces of matter in any way changed by a state of motion. By the decomposition of a compound body, its elements are

set free to form new combinations ; but the properties of those elements and the substance thereof, remain always the same, unchanged and unchangeable. Neither the decomposition of a compound, nor the combination of its elements with other elements of matter, can generate or develop any property, force or power, which did not previously exist in the elements themselves. This may be regarded as *a self-evident truth*. It must be true—unless something can be generated and produced from nothing. It is as utterly impossible for motion, or even the friction of two or more bodies to generate an element of matter, as it would be for mere space to produce such an effect. Bodies in motion may attract more strongly such mobile and subtle elements as caloric and electricity, than they do when at rest ; and by violent friction may press out of them, and thereby develop such subtle elements as may be in them in a latent state, or in the surrounding atmosphere—but to suppose that motion and friction can generate an element of matter, or can generate a force, power, and property, like caloric or heat, which can melt iron, stone, and all earthly substances, and reduce them to fluids, seems like a logical impossibility, and an absurdity.

Mode.

Prof. Tyndall and his school of scientists call heat *a mode of motion*—placing emphasis upon the word *mode*—as if it added great force to motion, and gave the phrase a meaning very different from the word motion alone ; but he does not point out what that difference is. The word *mode* when used in its most precise and definite sense, is applied only to action and motion. Every action and every motion must have mode, and therefore the phrase mode of motion, without defining or describing the mode, has precisely the same meaning as the word motion when used alone, and it has no other, broader or different meaning.

The word mode does not express any force or power, and the manner in which it is used by Tyndall and his disciples, in connection with the word motion, as a definition of heat, throws no new light upon the subject, but tends to obscure in some minds, what has been well known for thousands of years. Fire and heat are too well understood by all persons of common sense, to need any new definition, new description, or scientific theory to illustrate it. It would be difficult to conceive a more preposterous idea than that involved in Prof. Tyndall's definition of heat—that it is a mere *mode of motion*, destitute of substance.

Form.

Form is an incident to substance, and bears the same relation to substance that mode does to motion. Every thing which has substance must have form also. Form is inherent in substance and inseparable from it; but the word form never can be properly applied to the active properties, or forces of matter. Form is not an active property of matter, is never a force, and can never act as a cause; and yet the disciples of the mystical philosophy often use the term in an indefinite and mysterious sense, as if it represented a force of nature.

Force and Energy—Immaterial Force.

The words force and energy are often used by writers in a mystical sense, as if force and energy could and do exist, independent of matter and of substance. What do they mean by immaterial force? Do they mean a force inherent in and exercised by a Pantheistic, or Divine Spirit; or what do they mean? The vague and indefinite use of such words only serve to cover as with a vail, the ignorance of the writer, and carry the appearance of wisdom, by shrouding the subject in mystery.

Dynamical Energy—and Mechanical Force.

What is meant by dynamical energy, as used by Tyndall, Grove and others? Is it one of the forces of nature which I have enumerated; and if so, which of them? Is it the force of gravity; or is it a chemical force, a magnetic force, an electric force, or the force of caloric or heat? Is it a physical force, pertaining to inanimate matter only, or does it pertain also to living organisms? The manner in which the phrase is often used only tends to involve the subject in obscurity.

What is meant by mechanical forces, when applied to living organisms? All the mechanical powers, except the expansive power of steam, are based upon the force of gravity—to which the vital force acts antagonistically. Hence, it would seem that the phrase mechanical force has no proper application as an actual force, to either animal or vegetable organisms—except that the matter composing them occupies space, has the power of resistance, and also the property or force of gravity; and yet the terms are often used as if they constituted the chief motive power of animal organisms.

Molecular Force, and Molecular Action.

Molecular force, and molecular action, have been applied by writers to both animate and inanimate matter; and hence they do not mean that it is vital force. What do they mean? Do they mean anything different from the forces of nature—if so, what?

What do writers mean by the word molecule, which has been much used of late, in physics? Do they mean atoms, or combinations and compounds of atoms; and if compounds, what kind of a compound forms a molecule; and what forces can molecules possess which are not possessed by the atoms of which they are composed?

Transformation and Conversion of Forces.

Volumes have been written of late upon the correlation and conservation of forces. If the atoms of matter be indestructible and unchangeable, the properties and forces thereof must also be indestructible and unchangeable—from which the conservation of forces would result as a consequence, and it requires no long course of reasoning to prove it. But if the atoms and properties of matter be unchangeable, which seems to be a self-evident truth, the simple forces of nature, resulting from those properties, must also be unchangeable—and hence the conversion of one force into another, as is assumed by writers of the mystical school, is an impossibility. The assumption of this convertibility, is based upon the further assumption, stated by Prof. Youmens, that *heat, light, electricity, and magnetism, are not "subtle fluids with peculiar properties, but simply modes of motion in ordinary matter; forms of energy which are capable of mutual conversion."* Such strange assumptions, not in harmony with common sense, need proof. They need something more than scholastic subtleties and sophistry, to support them; but there is nothing too absurd to be embraced by the human mind as truth, if it be presented in the garb, and dignified with the name, of religion, philosophy, or science. Prof. Tyndall is in the front rank of a school of science, which, in its interpretation of many of the phenomena of nature, ignores common sense and the common understanding of mankind, as unworthy of the consideration of men of science, and bases its reasoning upon mere assumptions, improbable hypotheses, and fanciful theories.

Evolution and Development.

The subject of evolution and development was examined in the last chapter, and they were shown to be a process—not a force, power, nor cause of action; and that they need a moving power to originate them,

and carry them on. They are often used as if they constituted a mysterious force or power, by which the animal creation, as well as varieties thereof, were originally brought into existence.

The Imaginary Ether.

The subject of ether was examined in the last chapter. No word was ever used by man in so many inconsistent and conflicting senses as that of either. It is intended to represent the hypothesis of an elastic medium permeating all matter and all space; and the most marvelous and conflicting forces and powers are attributed to it. It is called *elastic ether*, when power is attributed to it, to act as a substitute for universal attraction, to move the earth and the planets, and all the heavenly bodies. When it is said to convey the sensation of light by its waves, it is called *luminiferous ether*. It is supposed to radiate heat and light in contrary directions, and in all directions at the same instant of time—to produce motion in solid bodies—to be the cause of intense heat of red-hot iron, and to excite no heat at all in ice. What is very marvelous in its action is, that it brings to the organs of sight images of all the objects in front of the eye.

Whether it be a self-acting power, or is dependent on a Pantheistic Spirit to move it, has not been explained by its advocates. If it be self-acting, it is impossible to conceive how it acts, unless it is in fact, a *Pantheistic Spirit*.

The defects in its luminiferous characteristics are, that they will not act, except under the influence of the sun's attraction, or the attraction of some other luminous body, or of a blaze of fire. On the side of the earth opposite to the sun the ether is opaque, and leaves us in darkness. Unlike other gases and fluids, it will not pass through crooked tubes and passages; which raises the suspicion that it is imaginary only, and does not, in fact, exist.

Accumulation and Radiation of Heat.

That heat is radiated from a burning fire, from a heated stove, from other super-heated bodies in which it is accumulated, and also from steam, is a fact so well attested by our senses, and by the common sense of mankind, that no one will deny it.

How can mere motion be accumulated and radiated as heat, in accordance with the motion theory of heat, and thereby produce upon the senses the effect of heat?

To suppose that motion can be radiated from a fire or heated stove, and produce the sensation of heat, without the emission of any substance which is the element or cause of heat, would be a self-evident absurdity. If anything is radiated that can excite the sensation of heat, it must be matter in motion; and if matter be radiated, whether you call it heat, caloric, or fire, the thing is the same, and the motion theory of heat must be false.

If motion be heat, then the degree and intensity of heat must depend upon the velocity of motion, and upon nothing else; and a state of rest must be the entire absence of any heat whatever—that is, a condition of rest must be a state of the most intense cold, and there can be no such thing as latent heat. The advocates of that theory have not considered the consequences which would flow from its principles.

Heat a ball of iron in a puddling furnace to a white heat, and the attraction of cohesion will still hold the particles firmly together, and keep them at rest, until the heat is raised to an intensity of about 3,000 degrees Fahrenheit, before it will melt and run. How is it possible to conceive that the fuel with which the furnace is heated, is decomposed and consumed by motion only, converted into motion, and the motion communicated to the iron, and the iron heated by the motion, when the fuel and the iron itself, and every part of it, is at rest? How could we be sensible of the heat of red-hot iron, or of a heated stove, some inches dis-

tant from us, unless atoms of heat radiate from the iron to the skin, and thus excite the sensation of feeling?

We cannot perceive that there is any more motion in a red-hot ball of iron in a puddling furnace, than there is in a body of ice upon the surface of a lake or river; and it is contrary to common sense to suppose that there is any motion in either. *The motion theory of heat involves the self-evident fallacy, that the particles of a red-hot ball or bar of iron are, and must be, in violent motion, while the ball or bar itself, as a whole, is at rest;* and yet, fallacious as it is, it has been stated as a scientific truth, by a leading writer and advocate of the theory, (Balfour Stewart). Verily, what has been dignified with the name of Science, has run into strange mysticisms and absurdities!

Does the thermometer measure the motion of the atmosphere, or the degree of heat arising from an element of matter, which causes the sensation of heat? If the heat of the atmosphere depended upon its motion, and was increased by increase of motion, it would be colder in ravines and valleys, than upon elevated plains, and upon the sides and tops of mountains; which is directly contrary to the fact.

Development of Heat by Friction.

That friction develops heat is a well-known fact. It is shown most frequently in the journal boxes of railroad cars, which are kept constantly oiled, to avoid heating. I say that friction develops heat—it cannot create heat, nor call it into existence de novo; nor can motion alone, without friction, even develop heat. To suppose that motion or friction can call heat into existence de novo, create it out of nothing, or increase the quantity of heat in the universe, would be an absurdity.

The question then arises, where does the heat produced by friction come from? As it is difficult, and perhaps impossible, to answer that question to the sat-

isfaction of all, it becomes necessary to study the process of friction, and the nature of heat, as the only means of solving the difficulty.

As to the nature of heat there are two theories: 1st, That heat is a subtle, volatile, imponderable fluid—one of the elementary substances of nature, which chemists have called caloric,—having certain affinities for every element of matter, and penetrating and pervading all the compounds of the world, and yet having no such affinity for any element as to form a chemical compound, or combination with it.

2d, The other—the new theory is, that heat is not matter—not substance—but only motion, or a mode of motion, without substance or properties; for it can have no properties without substance, and yet it produces real and sensible effects.

The only argument that has been presented against the material theory of heat is this—heat is constantly produced by the friction of the same things, as long as the friction continues, and it is said that if it were matter pressed out of the things rubbed together, the supply would soon be exhausted, and the fact that it is not exhausted but continues to be produced as long as the friction is continued, is argued as proof that heat cannot be material. As matter in motion communicates its motion to some extent to other bodies with which it comes in contact, it is argued that the heat produced by friction cannot be rationally accounted for as matter, and must be regarded as motion only.

Such are the slender foundations upon which the whole fabric of the motion theory of heat is based. If the theory were true, the heat would be confined, as the motion is, to the bodies which come in contact and produce the friction; and no sensible effects could be produced or felt beyond the surface of these bodies and the things coming in contact with them; which is not in accordance with the fact; for we know that heat is radiated and produces sensible effects at various distances from the radiating source—and I cannot conceive how *any thing, not material*, can be radiated

and produce such effects. Again, heat expands all substances which it penetrates—and that fact furnishes conclusive evidence that it occupies space, and has some of the properties of ponderable matter.

As heat produced by friction must be merely developed and accumulated at the point of friction, and cannot be thereby created or called into existence, it would seem that it must be pressed out of the surfaces of the things rubbed together; or 2d, come from and be pressed out of the atmosphere which is constantly drawn in between the bodies revolving rapidly in contact; or, thirdly, it must be strongly attracted by the bodies in motion, and caused to accumulate at the point of contact and friction, and thus aid in furnishing the supply of caloric developed by friction. So far as I can understand the subject, these are the three sources which furnish the supply of caloric or heat developed by friction.

There are some indications, I think, that matter in motion attracts both caloric and electricity more strongly than matter at rest. If any heat be developed by motion alone—without friction—it must be because matter in motion attracts caloric more strongly than matter does when in a state of rest. It would be difficult to assign any other rational cause, to account for the fact.

Combustion is a calorific process, and not a process of motion, nor of friction; though ignition and combustion may originate with caloric developed by friction. How can the advocates of the motion theory of heat explain, in accordance with their theory, the development of heat by combustion?

A very small amount of heat is developed by the friction of the machinery of mills and factories, and locomotive engines; but it cannot be made available and utilized by man—and not an hundredth part as much is so developed, as by the combustion of the fuel used in making the steam required to propel the machinery of mills operated by steam. The combustion of fuel by caloric furnishes, not only all the heat

that ever was made available to produce steam, to be used as a motive power, but also all that is used to warm factories and workshops, dwelling houses and other buildings—to warm the people in cold weather, and to cook their food at all seasons of the year. We must and do look to combustion, *not to motion nor friction*, as the great source of heat which can be made available, either as a motive power, for mechanical purposes, or for warming our buildings.

Though a very little heat may be developed by friction, *none was ever developed by motion alone*. Sufficient caloric can be developed by friction to ignite gun-powder, light a friction match, or kindle a fire with tinder, or with very dry and combustible materials; but not sufficient to heat an iron furnace to so high a temperature as to melt iron-stone, and the limestone used to flux it.

Evidence.

The human mind depends upon evidence, upon which it forms its opinions; and must depend mostly upon the organs of sense, to furnish it evidence, and upon its understanding to interpret the evidence; and when men disregard the evidence of their own senses, and the common sense and common understanding of mankind, and rely upon mere assumptions and fanciful theories, as the basis of their reasoning, they are in the condition of a mariner at sea in cloudy weather in the olden time, without a compass with which to guide the movements of his vessel.

Difficult and doubtful questions in matters of science, as well as in courts of justice, should be determined by the weight of evidence. Apply that rule to the motion theory of heat, and weigh in a balance the great truths of the generation of heat by combustion in great conflagrations, and the destructive effects of heat so generated, with the little obscure facts of the generation of heat by friction, and the latter will at once kick the beam. How trifling and insignificant the latter appear, when compared with the former!

What an overwhelming balance of evidence in favor of the old theory, of the generation of heat by the calorific process of combustion !

The great and striking facts of the conflagration of cities and forests by the calorific process of combustion, are disregarded by the advocates of the motion theory of heat, and not taken into the account by them, when reasoning in relation to the origin and cause of heat ; and the obscure and insignificant fact, that some degree of heat may be developed by friction, is made the sole basis of their reasoning upon the subject. They never allude to the generation of heat by combustion ; and their writings do not indicate that they are acquainted with any such phenomena.

Professors Tyndall, Huxley, and Maudsly, are at the head of the school of materialists, in England. In their reasoning to establish the doctrines of materialism, *they ignore, or overlook, the fact and phenomena of consciousness, the distinction between the physical effects made upon the organs of sense and the cognitions of such effects by the mind*—and also the evidences, which such cognitions, and the consciousness thereof, furnish of an intellectual element or principle, in man. They seem to be unacquainted with, or not to understand, the great principles of intellectual science.

Books on Chemistry and Physical Science.

Great efforts have been made during the last twenty years, by the advocates of the *ether theory* and the *motion theory of heat*, to infuse their doctrines into the public mind, into schools, and into books of science—and more especially into works on chemistry and physical science. They seem to have had almost the entire control for many years of the British Association, and have used it as a means of propagating their doctrines, and infusing them into the popular as well as the scientific mind of the United Kingdom ; but, as yet, they have had no very great success in the United States. The reception with which such doc-

trines have met with in Great Britain, and the admission they have gained into books on science published in that country, have not been without their influence here. Our authors and scientific men, however, have very generally received and treated them as *uncertain and doubtful speculative theories* which do not command their assent; but being supported by so many leading scientists abroad, they seem unwilling to take a bold stand against them, and to condemn them as fanciful and untenable. All our authors on chemistry of any standing, merely state the motion theory of heat as a hypothesis, and present *the subject in language and arguments, and use illustrations, which are consistent only with the theory, that heat is caused by an element of matter.* It is so with American books on Physics and Astronomy; in which these subjects are treated as if the world and the universe were governed by the *force of universal attraction*, and very little notice is taken of *the imaginary ether*.

Prof. Wilson, of Edinburgh, in his work on Inorganic Chemistry, has left out caloric, electricity and magnetism, as not elements of matter; though they are all treated in American works as *imponderable matter*, and the most active of all the elements of the material world.

The professor seems to have overlooked the fact, that the chemical affinities will not act without the stimulating influence of heat. His work presents chemistry emasculated. To perform experiments in chemistry successfully, it requires in the laboratory or room where they are performed, a temperature of about 70 degrees, to facilitate chemical action. Fermentation will not take place when the temperature is below 40, and will not progress very rapidly with a temperature below 70. The chemist can do nothing without the constant aid and stimulating influence of caloric, and he must have it in much larger quantities than can be furnished by friction. All the heat produced by friction in the Island of Great Britain would not be sufficient to warm properly the laboratory of one of her great Universities.

